The final exam will consist of questions from the following units:

Mole Conversions and Stoichiometry, States of Matter (KMT), Behavior of Gases, Solutions, Acids and Redox Reactions

Mole Conversions and Stoichiometry:

1. Determine the number of liters in 1 mole of any gas at STP
    - 22.4 L @STP
2. Determine the number of items in 1 mole of any substance
    - 6.02×10^{23}
3. Determine the number of grams in 1 mole of any substance
    - Elements = atomic weight
    - Compounds = molar mass or molecular weight
4. This section will be tested on the free response (problems) part
5. Complete percent yield calculations.

States of Matter:

6. Describe the points of the Kinetic Molecular Theory and how they relate to solids, liquids, and gases
    a. All matter is made of tiny particles
    b. All particles are in constant motion. The higher the temperature of the substance, the faster the particles move.
    c. All energy is conserved. When particles collide, no energy is lost
    d. At the same time temperature, more massive (heavier) particles move slower than less massive (lighter) particles.
7. Identify all six phase changes and describe what is happening during each change in terms of heat and energy of particles

    a. Solid to liquid: melting, more energy,
    b. Liquid to solid: freezing, less energy
    c. Liquid to gas: evaporation, more energy
    d. Gas to liquid: condensation, less energy
    e. Gas to solid: deposition, less energy
    f. Solid to gas: sublimation, more energy

8. Compare and contrast the four types of intermolecular forces (IMF's) in terms of strength and where they are found

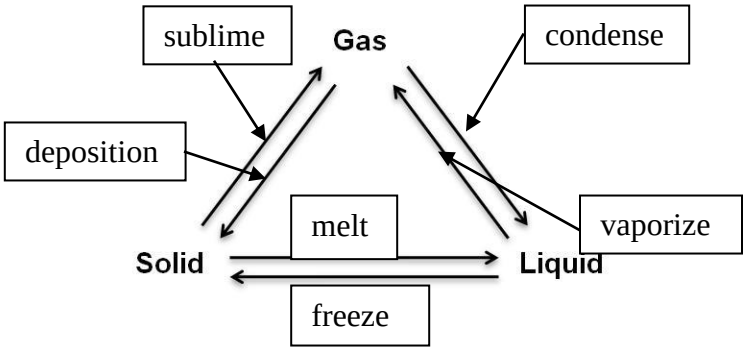
    a. Ionic bonds > H bonding > Van der Waals dipole-dipole interactions > Van der Waals dispersion forces.

9. Complete the following table

	Solid	Liquid	Gas
Definite volume? (Y/N)	YES	YES	NO
Fluid? (Y/N)	NO	YES	YES
Compressible? (Y/N)	NO	NO	YES
Attractive forces between molecules (strong/medium/none)	STRONG	MEDIUM	NONE
Speed of molecules	SLOW	MODERATE	FAST

- Water boils at 100 °C while methane (CH_4) boils at -161 °C. Both have similar masses. Explain using KMT why water boils at a higher temperature.
    - Hydrogen bonding
- Where will water boil at a higher temperature – Mount Everest or New Orleans? Explain. New Orleans-greater atmospheric pressure

10. Label the following diagram:



11. Determine the relationship between atmospheric pressure and boiling point
12. Define equilibrium, explain under what conditions can it exist, and the processes that are taking place when it does exist
    e. Can exist in a number of conditions. Two opposing processes such as dissolving and recrystalizing happen at the same rate
13. What does the term dynamic equilibrium mean?
    f. Means that is active
14. Which system is at dynamic equilibrium – a closed water bottle or an open one?
    g. Closed water bottle

Gases and Their Properties:

15. Define STP is 273 K or 0^{o} C and 760 mmHg or 1 atm
16. Convert between degree Celsius and Kelvin: K= 273 + ^{o}C
17. Solve all gas law problems (Boyle, Charles, Guy-Lussac, Combined, Ideal)
    - See problem section of this review

Solutions:

18. Define solute and solvent and differentiate between the two
    a. 1. Solute which is the substance being "dissolved"
    b. 2. Solvent which is the substance doing the dissolving.
    c. 3. The substance in greatest percentage is usually considered to be the solvent.

~~19. Determine which substances will dissolve the fastest (or slowest)~~

20. Describe the various ways to increase the dissolution of a solid in water
    d. 1. By stirring the solution (increase dispersion of solute)
    e. 2. By powdering the solid (increases surface area)
    f. 3. By heating the solvent (increases particle activity)
    g.
21. Describe the relationship between temperature and the solubility of gases in water
    h. The solubility of a gas decreases as the temperature of the solvent increases.
22. Describe the relationship between temperature and the solubility of solids in water.
    i. Generally, increasing the temperature increases the solubility of solids in liquids.
    j. Another way to say this is increasing temperature increases concentration
23. Differentiate between an electrolyte and non-electrolyte solution
    k. Substances that can dissolve in water and the solution can conduct electricity are called *electrolytes*.
    l. Substances that can dissolve in water and the solution cannot conduct electricity are called *nonelectrolytes*
24. Determine what substances will dissolve in each other (relate to terms of polarity)
    m. A General rule applied to solute-solvent relationships goes like this: " Like dissolves like"
    n. There are two types of solutes and solvents.
    o. They are polar and nonpolar.
25. Calculate the following: see problem section
    p. Molarity
    q. Molality
    r. Weight by percent
26. Answer questions using a solubility chart. See problem section

27. Describe how certain solutes will affect the freezing and boiling points of a solvent.
    s. Colligative properties depend only on the number of dissolved particles in solution and not on their identity.
    t. Freezing point depression of the solvent
    u. Boiling point elevation of the solvent

28. Calculate the freezing and boiling points of solutions
    v. See problem practice section

Acids and Bases:

29. List the properties of acids and bases
30. Acids
    w. sour taste
    x. contain the element hydrogen
    y. some will react with metals to produce hydrogen gas
    z. change the colors of acid-base indicators
    aa. will react with bases to form a salt and water
31. Bases
    bb. bases have a bitter taste
    cc. dilute solutions feel slippery to the touch
    dd. will change the color of a acid-base indicator
    ee. bases react with acids to produce a salt and water
    ff. will destroy animal tissue

32. Describe Arrhenius acids and bases
    gg. Acid-a chemical compound that contains hydrogen and ionizes in aqueous solution to form hydrogen ions
    hh. Base-a substance that contains hydroxide ions and dissociates to produce hydroxide ions in water
    ii. said to be alkaline
33. Describe Brønsted-Lowry acids and bases
    jj. Acid-any ion or molecule that can donate a proton such as water
    kk. Base-any molecule or ion that is a proton acceptor
34. Differentiate between conjugate acid and conjugate base
    ll. A conjugate base is:
    mm. what remains of an ion or molecule after it has donated a proton
    nn. and the ion or molecule may now accept a proton
    oo. A conjugate acid is:
    pp. what remains after an ion or molecule has accepted a proton
    qq. and can now donate a proton
35. Determine the conjugate acid-base pairs in a chemical reaction See practice problems

36. Calculate pH, pOH, $[H^+]$, and $[OH^-]$ using the given equations: see problem practice section
37. Determine if a substance is acidic or basic based on its respective pH, pOH, $[H^+]$, or $[OH^-]$
38. 0-6.999 is acidic 7.001 -14.000 is basic or alkaline
39. Describe how the pH scale compares the acidity of any two substances, given their respective pH values
40. Determine the products of a neutralization reaction, and solve titration problems

$$\text{acid} + \text{base} \longrightarrow \text{a salt} + H_2O$$

41. How can you identify an Arrhenius acid from its formula? An Arrhenius base?
42. Formulas for acids start with H
43. Formulas for bases will have OH

Redox Reactions:

44. Assign correct oxidation numbers (charges) using the rules
45. Define oxidation and reduction
46. Oxidation is the loss of e^-; ox # increases
47. Reduction is the gain of e^-; ox # decreases
48. Identify the oxidation and reduction half reactions
49. Use OILRIG
50. In a reaction, the
    - **Oxidizing agent** gets **reduced**.
    - The **reducing agent** gets **oxidized**.